TOTAL REDUCED SULPHUR MONITORING SURVEY CONDUCTED IN SMOOTH ROCK FALLS FROM OCTOBER 1980 TO APRIL 1982

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Introduction:

Ambient concentrations of Total Reduced Sulphur (TRS) compounds, expressed as hydrogen sulphide (H_2S), were monitored in the Town of Smooth Rock Falls from October 1980 to April 1982. The purpose of this monitoring program was to determine ambient levels of TRS in the Town before and after the installation of additional pollution control equipment at the Abitibi Paper Company Limited kraft mill as required under a Ministry of the Environment Control Order.

Monitoring Program:

The monitoring station was located at the Municipal Garage which is in the west end of the Town, off Second Avenue (see Figure 1). This monitoring site is about 0.4 kilometers from the centre of the Abitibi Mill Complex. A TECO 43 sulphur dioxide (SO_2) analyzer, in combination with a TECO 340 TRS to SO_2 converter, was used to measure ambient TRS concentrations. The converter unit oxidizes all reduced sulphur compounds emitted from kraft pulp mills such as ethyl mercaptan, methyl mercaptan, dimethyl sulphide, dimethyl disulphide, etc. to SO_2. The concentration of the resulting SO_2 is then measured by the SO_2 analyzer. Compensation for the background SO_2 present in the air is provided for, such that this SO_2 is not included in the determination of the actual TRS concentrations in the ambient.

The monitoring program was terminated in April of 1982 for the following reasons: first of all, it was realized that the station was located too

close to the mill complex, thereby possibly underestimating TRS groundlevel concentrations at the point of impingement which is believed to be further downwind. Secondly, the TECO analyzer was found to be too temperature sensitive for the environment present in the Municipal Garage, resulting in appreciable and undesirable instrument signal drifts. Lastly, problems were encountered with the converter unit with respect to calibrations using the internal H_2S source. These instrumentation problems are felt to have resulted in lower than actual TRS levels by as much as 20% during fumigations. However it is believed, that on average, the margin of error was actually considerably less than that figure. Improvements in the operation of the converter have now been realized such that the accuracy of the data is believed to be acceptable.

Provincial Criterion for TRS:

The current provincial ambient air quality objective for TRS emitted from kraft pulp mills is set at 40 $\mu g/m^3$ (27 ppb), expressed as H_2S averaged over one hour. In addition, a provisional guideline for TRS, again expressed as H_2S, of 27 ppb for a half-hour average has been set by the Ministry. This guideline is used for the approval of new or modified facilities. The provisional guideline is considered a temporary measure until such time when ambient monitoring methodology has developed to the point of enabling the individual measurement of the major reduced sulphur compounds involved. At the Abitibi mill, stack gas measurements have shown that most (>90%) of the TRS emissions consist of H_2S.

Results:

A summary of the TRS data, expressed as H_2S, collected in Smooth Rock Falls from October 1980 to April 1982 is presented in Table 1. Computer printouts of the raw data are appended. From October 21 to December 31, 1980 only one hour exceeded the provincial hourly criterion of 27 ppb; the maximum hourly average recorded was 29 ppb. The average for this period was 0.3 ppb. In 1981, which was the only complete year of monitoring, the hourly criterion was exceeded during a total of 119 hours. The maximum hourly average recorded was 116 ppb, whereas the average TRS level for the year was 2.1 ppb. From January 1 to April 28, 1982, the hourly criterion was exceeded on 30 occasions; the maximum hourly average recorded was 82 ppb and the average concentration was 2.0 ppb.

A more detailed summary is provided in Table 2. From these data, it appears that TRS concentrations were generally higher during the colder months, and/or when the wind is predominantly from the north. During these periods the monitoring station is likely to be, on average, downwind of the mill.

Of significant interest is the impact on ambient TRS levels (at the monitoring location) of additional pollution control equipment installed at the Abitibi mill in June 1981 to reduce stack TRS emissions. Analysis of the data, see Table 3, for the periods October to May 1981 and July 1981 to April 1982 (excluding February 1982 due to the shutdown of the scrubber from February 11 to 26) revealed that the average monthly TRS levels and the number of hours over the criterion were marginally higher during the time that the scrubber was in operation.

Without more detailed mill operations data, wind speed/direction data from Smooth Rock Falls, and on the basis of the TRS data available at this time, it appears that the additional air pollution control equipment installed at the Abitibi mill in June of 1981 had no significant impact on TRS levels as measured at the Municipal Garage during the period covered in this report. However, it should be emphasized that the TRS data base both before and after June 1981 is rather limited and that start-up problems could have been experienced with the new air pollution control system. In addition, fugitive (low level) TRS emissions from the complex could have masked contibutions from stack emissions, in view of the close proximity of the monitoring station.

This finding stresses the need for continued TRS monitoring in the Town at a different location and over a longer period of time in order to better determine average ambient TRS levels, and also to better assess the effect of additional pollution control measures for stack gases at the Abitibi mill. There is also a need to determine the contribution of TRS fugitive emissions in order to better assess the performance of present/future abatement measures. This can best be done by conducting a mobile TRS monitoring survey in the Town.

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TABLE 1

SUMMARY OF TOTAL REDUCED SULPHUR DATA COLLECTED IN SMOOTH ROCK FALLS
FROM OCTOBER 1980 TO APRIL 1982

	Sample Size (Hours)	Valid Data (%)	Max. Value (ppb)	Arithmetic Mean (ppb)	No. of Hours Above The Provincial Criterion	% Above Criterion *
1980	1704	77.2	29	0.3	1	0.06
1981	8682	99.1	116	2.1	119	1.38
1982	2634	91.5	81	2.0	30	1.13

* Provincial Criterion is 27 parts per billion (ppb) for one hour.

TABLE 2

SUMMARY OF TOTAL REDUCED SULPHUR DATA COLLECTED IN SMOOTH ROCK FALLS
FROM OCTOBER 1980 TO APRIL 1982

	Sample Size (Hours)	Average Concentration (ppb)	No. of Hourly Averages	
			11 to 27ppb	greater than 27 ppb
1980 October	248	0.5	4	0
November	716	0.2	3	1
December	740	0.3	8	0
1981 January	739	0.8	7	4
February	657	2.1	29	12
March	715	3.8	59	15
April	718	3.1	35	31
May	742	2.7	32	5
June	720	2.4	25	18
July	739	0.7	12	1
August	744	1.2	25	4
September	709	0.1	0	0
October	738	0.7	22	0
November	718	1.8	22	11
December	743	5.7	38	18
1982 January	740	0.9	14	4
February	583	0.7	7	2
March	658	4.4	30	14
April	653	2.0	15	10

TABLE 3

SUMMARY OF TOTAL REDUCED SULPHUR DATA COLLECTED IN SMOOTH ROCK FALLS
FROM OCTOBER 1980 TO MAY 1981

Sample Size (Hours)	Average Monthly Concentration (ppb)	No. of Hours Over Provincial Criterion
4747	1.7	68

SUMMARY OF TOTAL REDUCED SULPHUR DATA COLLECTED IN SMOOTH ROCK FALLS
FOR THE PERIOD JULY 1981 TO APRIL 1982
(EXCLUDING FEBRUARY 1982)

Sample Size (Hours)	Average Monthly Concentration (ppb)	No. of Hours Over Provincial Criterion
6442	1.9	72